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## INTRODUCTION

In accordance with the City Auditor's 1988-89 Audit Workplan, we have reviewed the San Jose Airport Department's parking and shuttle bus operations. We conducted this audit in accordance with generally accepted government auditing standards, and limited our work to those areas specified in the Scope and Methodology section of this report.

## BACKGROUND

Airport Parking Operations is responsible for managing parking lot operations and the free shuttle bus service to and from daily and employee parking lots. During 1987-88, over 1.9 million vehicles used the airport parking lots. In addition, the Airport's shuttle buses transported more than 1.5 million passengers.

The Airport Department has six revenue sources which it projects will generate over \$28 million in 1988-89. Of these revenue sources, vehicle parking fees is the largest. The Department estimates that 1988-89 parking revenue will be \$12.2 million, about 43 percent of total revenues. TABLE I summarizes the Department's revenue by source for 1985-86 through 1988-89.

**TABLE I**

**SUMMARY OF AIRPORT DEPARTMENT REVENUE  
SOURCES FOR FISCAL YEARS 1986 THROUGH 1989**

<u>Revenue Category</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989(a)</u>	<u>% of 1989</u>
Parking	8,982,116	9,353,222	11,215,448	12,200,000	43
Airline rates and charges	4,276,019	3,510,569	6,155,730	5,885,000	21
Terminal building	4,709,159	5,126,044	5,640,645	5,262,000	19
Airfield area	685,161	617,158	1,249,922	1,070,000	4
Petroleum products	3,696,280	2,007,438	1,145,060	967,000	3
General aviation	<u>1,019,657</u>	<u>1,263,007</u>	<u>1,369,215</u>	<u>2,780,000</u>	<u>10</u>
TOTALS	<u>23,368,392</u>	<u>21,877,438</u>	<u>26,776,020</u>	<u>28,164,000</u>	<u>100%</u>

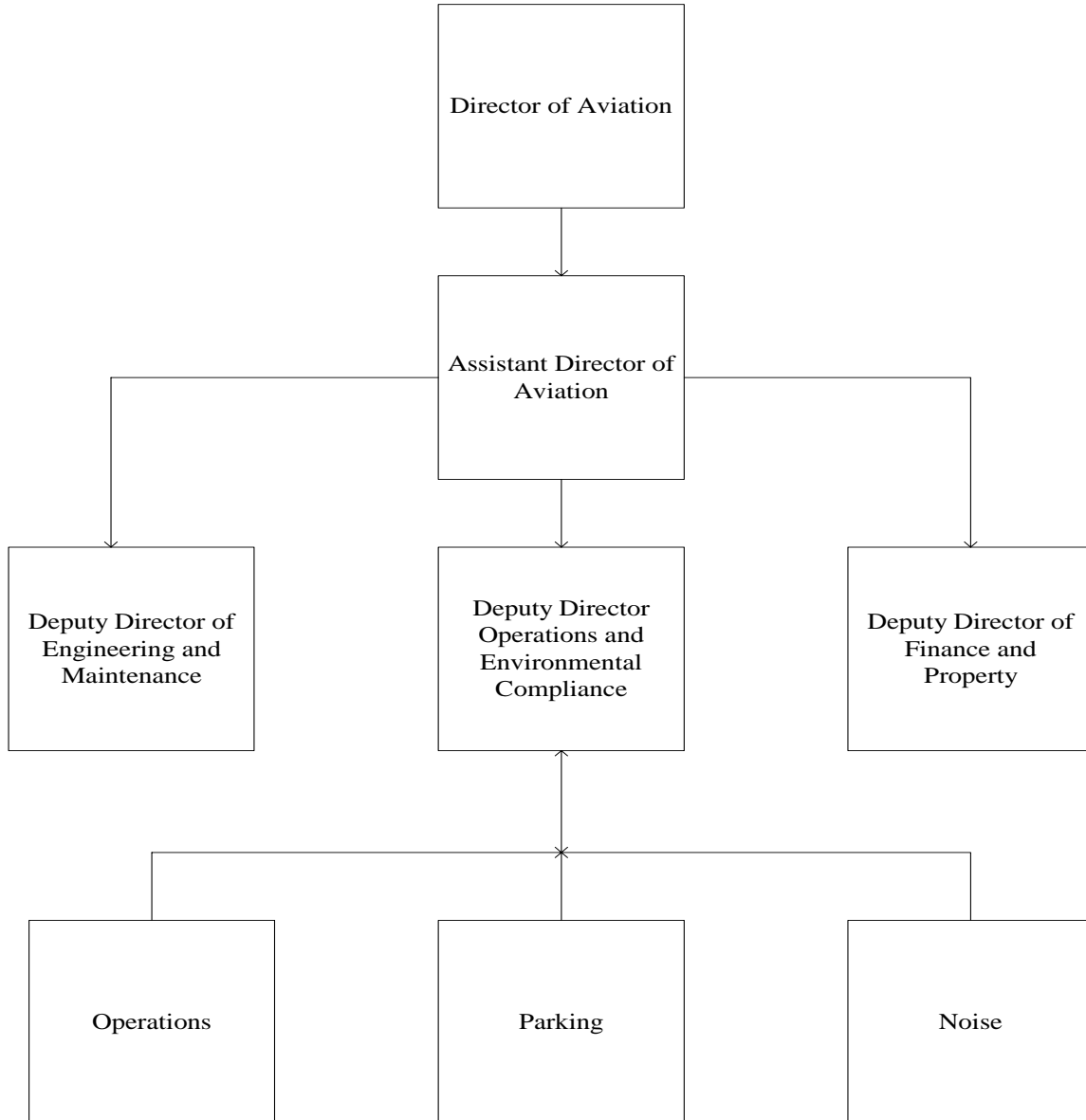
(a) Airport Department Estimates

Airport Parking Operations

As shown in the following chart, Airport Parking Operations is a component of the Airport Parking and Roadways Program. The Deputy Director, Operations and Environmental Compliance is responsible for that program. Airport Parking Operations staff include one Parking Coordinator and one Account Clerk. The Parking Coordinator has significant responsibilities for overseeing parking lot operations and collections and shuttle bus service. These responsibilities include overseeing the performance of AMPCO Parking, an outside contractor that operates the parking lots and the shuttle bus service. AMPCO Parking is a subsidiary of American Building Maintenance Industries, Inc. Another provider, Mobile Equipment Repair Service, Inc., maintains the Department's fleet of 26 shuttle buses.

# ORGANIZATION CHART

## AIRPORT DEPARTMENT CITY OF SAN JOSE





## Parking Lots

The Department operates one Short-Term Lot, three Long-Term Lots, and one Employee Lot. The Short-Term or Hourly Lot charge is 50 cents per half-hour with no maximum amount. The Long-Term or Daily Lots charge is 50 cents per half-hour up to a maximum of \$6.00 for each 24-hour period. Department employees are exempted from paying parking fees. Airport tenant and airline employees pay \$5.00 per month.

About 80 percent of total parking revenue is in the form of cash and personal checks. Credit cards account for the remaining 20 percent. The Department pays First Interstate Bank a fee to guarantee personal checks used to pay for parking fees. The Department also pays various collection/processing fees on credit card payments. During 1987, the Department paid \$72,798 in check guarantee and credit card processing fees.

## Shuttle Bus Service

The Department provides free shuttle bus service for airport customers and employees. The fleet services four routes between the front of the terminal and the daily parking lots. Of these three routes, the Green, Orange, and Yellow, service airport customers. The other route services Department, airline, and airport tenant employees.

There are 26 vehicles in the shuttle bus fleet. They range in age from one to eight years old. Of the 26 vehicles, 24 hold 17 passengers. The other two vehicles hold 31 passengers. The purchase price of the vehicles ranged from \$38,115 to \$53,550.

### Outside Service Providers

The Department uses AMPCO Parking and Mobile Equipment Repair Service Inc. to provide services essential to the parking and shuttle bus operations. Under the general direction of the Department's Parking Coordinator, AMPCO operates the parking lots and the shuttle bus service on a month-to-month contract. AMPCO has a cost plus fee contract with the Department. The Department pays AMPCO for necessary operating expenses plus a \$2,000 to \$3,000 monthly management fee. The Department has contracted with AMPCO since July 1, 1979.

AMPCO hires its own employees, including a parking manager, supervisors, cashiers and shuttle bus drivers. During our audit, AMPCO averaged about 186 employees.

As the parking lot operator, AMPCO collects all parking fees and deposits them into a company bank account. AMPCO then writes a check for the previous day's revenue. The Department deposits the check into the City's bank account. The Parking Coordinator is responsible for monitoring the daily revenue collections, AMPCO's expenses and the maintenance of parking lot equipment.

Mobile Equipment Repair Service, Inc. maintains the shuttle bus fleet. Mobile has been providing equipment repair and maintenance services to the Department on an open purchase order arrangement since 1982. The projected value of the open purchase order for 1988-89 exceeds \$1 million. The Operations Superintendent is responsible for coordinating and monitoring shuttle bus repair and maintenance.

## SCOPE AND METHODOLOGY

This audit report is the first of two reports covering the San Jose Airport Department's parking and shuttle bus operations.

Our audit included a review of the City's contract with ABM Parking Services, Inc., (now called AMPCO Parking), and AMPCO's reporting, audit, and computer files back-up procedures. On August 31, 1988, we also observed the parked vehicle inventory process which AMPCO performs daily. In addition, during October 1988 and March 1989, we observed the shuttle bus operations at various time intervals on a 24 hour-a-day basis. Further, we contacted other airports to obtain comparative data on shuttle bus services and maintenance costs.

We also tested mathematical parking fee computations for 1988. In addition, we reviewed current equipment maintenance records and reporting procedures, and tested daily parking revenue flows from AMPCO's records through the Department's transaction logs to the Finance Department's records.

As a basis for our audit, we performed a risk assessment of the Department's revenue system. The purpose of our risk assessment was to determine the potential for revenue loss arising from various threats or risks inherent to parking operations. We solicited the Department's input regarding inherent parking operations threats and the extent to which existing controls mitigate those threats. We then verified and tested those

controls which we determined to be the most significant. Based on the results of our examination, we estimated the degree of effectiveness of the existing controls. Finally, we recommended additional controls and enhancements to reduce the Department's exposure to revenue loss and excessive costs and to improve the efficiency of its shuttle bus service.

## FINDING I

### EFFICIENCY IMPROVEMENTS COULD REDUCE THE COST OF AIRPORT SHUTTLE BUS SERVICES BY MORE THAN \$1 MILLION PER YEAR

The Airport Department provides free shuttle bus services for airline passengers and Department, airline, and airport tenant employees. The Department will spend approximately \$3 million dollars in 1988-89 to provide this service. Our review revealed that the Department's shuttle bus service can be operated more economically and efficiently. Specifically, we observed on October 13, 1988, October 14, 1988, and March 3, 1989 that:

- 30.3 percent of shuttle buses arrived at the terminal empty and left empty
- The average number of riders per shuttle bus trip was only 2.68
- An average 23.9 percent of the shuttle buses from the same parking lot arrive at the terminal within one minute of each other
- Off-Peak Hour shuttle bus arrival time intervals were nearly one-half of the Department's objective of five to six minutes

In addition, we determined that San Jose's cost per shuttle bus rider was approximately two to two and one-half times higher than San Francisco's and Oakland's cost in 1987-88.

Further, it appears that San Jose's cost to maintain and repair its shuttle buses is excessive. Specifically, we estimate that:

- San Jose is estimated to spend over \$1 million to maintain and repair its 26 shuttle buses in 1988-89.
- San Jose's estimated cost for maintenance and repairs in 1988-89 is nearly \$41,000 per shuttle bus. This is more than the original purchase price for many of the shuttle buses.
- San Jose's estimated cost per shuttle bus for maintenance and repairs is more than four times San Francisco's and nearly seven times what the City of San Jose pays to repair and maintain its other passenger vehicles.

Finally, our review revealed that the Department increased its shuttle bus service without adequate study or analysis.

We estimate that the Department could save more than \$1 million annually and still meet its level of service objectives by improving the economy and efficiency of its shuttle bus service. Given the importance of the Airport's shuttle bus services and its escalating cost, the Department should consider adding staff to help analyze, monitor and coordinate shuttle bus schedules, levels of service and contractor billings.

## Shuttle Bus Service

The Airport Department provides free shuttle bus services for airline passengers and Department, airline, and airport tenant employees.

Currently, the Airport has 26 buses to service four shuttle bus routes between the daily parking lots and the terminal. Of these four routes, three are for the general public and one is for employees.<sup>1</sup>

The Airport is undergoing a major expansion program. Because of the resultant construction, the daily parking area was relocated. As a result, the Airport increased in the early part of 1988-89 1) the number of shuttle bus routes from two to four, 2) the number of buses in use from 14 to 26, and 3) the number of bus drivers from about 55 to 78. The cost of shuttle bus service has increased proportionately.

## Cost Trends

The Shuttle Bus Service Program cost the San Jose Airport about \$1,200,000 in 1985-86, \$1,500,000 in 1986-87, and almost \$1,900,000 in 1987-88. We estimate that the Shuttle Bus Service Program will cost about \$3 million in 1988-89. TABLE II summarizes the cost of the Airport Shuttle Bus Service Program from 1985-86 through 1988-89.

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<sup>1</sup> See APPENDIX A for a map of Airport parking lots.



TABLE II  
SUMMARY OF SHUTTLE BUS SERVICE  
PROGRAM COSTS FROM  
1985-86 THROUGH 1988-89

<u>COSTS</u>	<u>1985-86<sup>2</sup></u>	<u>1986-87<sup>2</sup></u>	<u>1987-88<sup>2</sup></u>	<u>1988-89<sup>3</sup></u>
Salaries	\$584,122	\$755,401	\$896,686	\$1,337,700
Insurance	n/a	n/a	22,050	29,500
Fringe Benefits	199,770	258,347	306,666	457,500
Equipment Repairs and Maintenance	289,463	405,806	570,950	1,057,700
Fuel	40,147	54,435	64,216	94,400
Depreciation	<u>53,776</u>	<u>57,160</u>	<u>90,020</u>	<u>107,200</u>
TOTALS	<u>\$1,167,278</u>	<u>\$1,531,149</u>	<u>\$1,950,588</u>	<u>\$3,084,000</u>

### Shuttle Service Can Be Operated More Efficiently

As part of our audit, we observed and recorded for 1,983 shuttle bus trips 1) the times shuttle buses arrived at the main terminal, 2) the shuttle bus number, 3) the parking lot being served, and 4) the number of riders boarding or deboarding the shuttle buses. Our observations were made on October 13, 1988, October 14, 1988, and March 3, 1989. Our observations essentially covered shuttle bus service on a 24-hour basis as follows:

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<sup>2</sup> City Finance Accounting and Airport Accounting Files.

<sup>3</sup> City Auditor estimate.

TABLE III  
SUMMARY OF SHUTTLE BUS SERVICE OBSERVATIONS

<u>Observation Date</u>	<u>Day of the Week</u>	<u>Hours Shuttle Bus Services Were Observed</u>
October 13, 1988	Thursday	12:00 a.m. - 2:00 a.m. 8:00 a.m. - 10:00 a.m. 4:00 p.m. - 6:00 p.m. 7:00 p.m. - 9:00 p.m.
October 14, 1988	Friday	12:00 a.m. - 2:00 a.m. 8:00 a.m. - 10:00 a.m. 4:00 p.m. - 6:00 p.m. 7:00 p.m. - 9:00 p.m.
March 3, 1989	Friday	3:00 a.m. - 8:00 a.m. 10:00 a.m. - 4:00 p.m. 6:00 p.m. - 7:00 p.m. 9:00 p.m. - 12:00 a.m.

We input all of the 1,983 shuttle bus trips we observed onto a computer file. By so doing, we were able to do various analyses of our observed shuttle bus trips. Based upon our analyses, we have developed the following information which, in our opinion, evidences a lack of sufficient Department analysis and monitoring of shuttle bus schedules with resultant inefficient shuttle bus service.

### 30.3 Percent Of Shuttle Buses Arrived At The Terminal Empty And Left Empty

Of the 1,983 shuttle bus trips we observed, 30.3 percent arrived at the terminal empty and left empty. Further, the percent of empty shuttle buses varied from a low of 24.3 percent for the Employee Parking Lot to a high of 40.2 percent for the Yellow Parking Lot. In addition, we observed that 49.2 percent of the shuttle buses carried no more than one rider, 63.1 percent

carried no more than two riders, and 73.3 percent carried no more than three riders. Moreover, for 96.2 percent of our observed shuttle bus trips, 10 or fewer riders either board or deboard the shuttle bus. TABLE IV is a summary, by parking lot route, of the percent of observed shuttle bus trips with zero to 27 riders either boarding or deboarding.

TABLE IV  
SUMMARY BY PARKING LOT ROUTE, OF THE PERCENT  
OF OBSERVED SHUTTLE BUS TRIPS WITH ZERO TO 27  
RIDERS BOARDING OR DEBOARDING

*Percentage of Observed Shuttle Bus Trips  
By Parking Lot Route, That Did Not Carry  
More Than the Indicated Number of Riders*

The Number of Riders Observed Boarding or Deboarding Each Shuttle Bus Trip	Employee <u>Lot</u>	Green <u>Lot</u>	Orange <u>Lot</u>	Yellow <u>Lot</u>	Total <u>Lots</u>
0	24.3	25.6	30.1	40.2	30.3
1	45.8	44.9	43.4	61.4	49.2
2	59.6	59.7	55.0	76.8	63.1
3	71.1	69.9	65.1	86.0	73.3
4	77.8	76.1	73.1	90.9	79.7
5	84.7	81.7	79.8	94.5	85.3
6	88.7	84.0	84.6	96.6	88.6
7	91.1	86.9	88.2	97.5	91.0
8	92.7	89.4	90.7	98.6	92.3
9	94.1	91.5	93.0	99.5	94.6
10	95.5	94.4	94.9	99.7	96.2
11	96.7	95.4	96.0	99.7	97.0
12	97.3	96.0	97.7	100.0	97.8
13	98.1	97.0	97.7		98.3
14	98.3	97.8	98.1		98.7
15	98.5	98.0	98.7		99.0
16	98.5	98.2	98.9		99.1
17	98.9	99.0	99.3		99.5
18	99.1	99.4	99.7		99.8
19	99.3	99.6	99.7		99.9
21	99.5	99.6	100.0		100.0
23	99.7	99.6			100.0
26	100.0	99.6			100.0
27		100.0			100.0

As TABLE IV shows, only 20 percent of the shuttle bus trips we observed carried more than 4 riders. In addition, we did not observe a single instance when a Yellow Lot shuttle bus had more than 12 riders either board

or deboard. In our opinion, the percentage of empty or near empty shuttle bus trips shown above evidence inefficient shuttle bus service. In addition, we observed that empty or near-empty shuttle buses create unnecessary traffic congestion at the terminal.

The Average Number Of Riders Per Shuttle Bus Trip Was Only 2.68

For the 1,983 shuttle bus trips we observed, 5,312 riders either boarded or deboarded. This computes to an average of only 2.68 riders per shuttle bus trip. This average varied from a high of 3.2 riders for the Green and Orange Lots to a low of 1.6 riders for the Yellow Lot.

TABLE V summarizes the number of shuttle bus trips, the number of riders boarding or deboarding, and the average number of riders per trip we observed for each parking lot.

TABLE V

SUMMARY OF THE NUMBER OF SHUTTLE  
BUS TRIPS, NUMBER OF RIDERS, AND  
AVERAGE FOR EACH PARKING LOT

<u>NUMBER PARKING LOT</u>	<u>NUMBER OF TRIPS</u>	<u>NUMBER OF RIDERS</u>	<u>AVERAGE RIDERS PER TRIP</u>
Employee	494	1,438	2.91
Green	481	1,520	3.16
Orange	475	1,501	3.16
Yellow	<u>533</u>	<u>853</u>	<u>1.60</u>
TOTAL	1,983	5,312	2.68

It should be noted that the average riders per trip is fairly consistent for the Employee, Green, and Orange parking lots. However, the average riders per trip for the Yellow Parking Lot is about half the other lots. Ironically, while the Yellow Lot had the highest number of trips, it also had more than 40 percent fewer riders than the other lots. In our opinion, this obvious contradiction, coupled with the overall low number of riders per shuttle bus trip, further evidences a lack of optimum shuttle bus scheduling.

An Average Of 23.9 Percent Of The Shuttle  
Buses From The Same Lot Arrived At The  
Terminal Within One Minute Of Each Other

During our observation of shuttle bus service we noted many instances of chaotic shuttle bus arrivals and departures with resultant rider confusion. For example, shuttle buses sometimes ran in groups. Other times, shuttle buses from the same route arrived at the Airport's terminal at the same time. On occasion, empty shuttle buses passed by without stopping at any of the designated shuttle bus stops located in front of the terminal. In our opinion, these observations evidence shuttle bus service inefficiencies.

During our observations on October 14, 1988, and March 3, 1989, we timed and recorded 1,452 shuttle bus trips. TABLE VI summarizes by parking lot, the number and percent of shuttle buses that arrived within zero to 24 minutes of each other.

TABLE VI  
SUMMARY OF THE NUMBER AND PERCENT  
OF OBSERVED SHUTTLE BUSES BY PARKING LOT,  
ARRIVING WITHIN ZERO TO 24 MINUTES OF EACH OTHER

Bus Arrival Interval In Minutes	<u>Employee Parking Lot</u>		<u>Green Parking Lot</u>		<u>Orange Parking Lot</u>		<u>Yellow Parking Lot</u>		<u>All Routes</u>	
	Number Of Trips	Percent	Number Of Trips	Percent	Number Of Trips	Percent	Number Of Trips	Percent	Number Of Trips	Percent
0	31	7.9%	14	3.8%	13	4.0%	24	6.5%	82	5.6%
1	73	18.7%	64	17.6%	50	15.3%	78	21.1%	265	18.3%
2	74	18.9%	80	22.0%	56	17.1%	80	21.6%	290	20.0%
3	62	15.9%	65	17.9%	61	18.7%	62	16.8%	250	17.2%
4	58	14.8%	56	15.4%	46	14.1%	35	9.5%	195	13.4%
5	42	10.7%	34	9.3%	32	9.8%	27	7.3%	135	9.3%
6	21	5.4%	23	6.3%	24	7.3%	24	6.5%	92	6.3%
7	13	3.3%	12	3.3%	27	8.3%	10	2.7%	62	4.3%
8	0	0.0%	4	1.1%	7	2.1%	11	3.0%	22	1.5%
9	9	2.3%	2	0.5%	4	1.2%	6	1.6%	21	1.4%
10	2	0.5%	4	1.1%	4	1.2%	3	0.8%	13	0.9%
11	3	0.8%	2	0.5%	1	0.3%	2	0.5%	8	0.6%
12	1	0.3%	0	0.0%	1	0.3%	1	0.3%	3	0.2%
13	1	0.3%	0	0.0%	1	0.3%	3	0.8%	5	0.3%
14	0	0.0%	2	0.5%	0	0.0%	1	0.3%	3	0.2%
15	1	0.3%	0	0.0%	0	0.0%	2	0.5%	3	0.2%
16	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
17	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
18	0	0.0%	1	0.3%	0	0.0%	0	0.0%	1	0.0%
19	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
20	0	0.0%	1	0.3%	0	0.0%	0	0.0%	1	0.0%
21	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
22	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
23	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
24	<u>0</u>	<u>0.0%</u>	<u>0</u>	<u>0.0%</u>	<u>0</u>	<u>0.0%</u>	<u>1</u>	<u>0.3%</u>	<u>1</u>	<u>0.0%</u>
	<u>391</u>	<u>100.0%</u>	<u>364</u>	<u>100.0%</u>	<u>327</u>	<u>100.0%</u>	<u>370</u>	<u>100.0%</u>	<u>1,452</u>	<u>100.0%</u>

As is shown above, 5.6 percent of the shuttle buses from the same parking lot arrived at the terminal at about the same time. In addition, 23.9 percent (5.6% + 18.3%) of the shuttle buses from the same parking lot arrived within one minute of each other. Overall, we calculated that a

shuttle bus from one of the four parking lots arrived at the terminal every 57 seconds. In our opinion, situations like these prompted the following passenger comments on an Airport Passenger Opinion Survey:

*“Buses are erratic.”*

*“Why 6-8 buses all at once and then nothing!”*

*“Shuttle buses are not well spaced. They run in ‘packs’ like wild dogs.”*

During our observations of shuttle bus service, we noted several instances of passenger confusion regarding where to board a shuttle bus and which shuttle bus to board. Shuttle buses arriving at the same time and a lack of adequate shuttle bus signage appear to be causal to this confusion.

#### Off-Peak Hour Shuttle Bus Arrival Time Intervals Were Nearly One-Half Of The Department’s Objective Of Five To Six Minutes

The Airport Department has established standards for peak hour arrival time intervals for shuttle buses.<sup>4</sup> According to the Department’s Parking Coordinator, the off-peak hour arrival time interval target is five to 6 minutes. However, our analysis revealed that shuttle buses from the same lots arrived at the terminal in 2.92 to 4.97 minute intervals during off-peak hours, as is shown in TABLE VII.

TABLE VII

#### SUMMARY OF AVERAGE SHUTTLE BUS ARRIVAL INTERVALS BY PARKING LOT DURING OFF-PEAK HOURS

#### AVERAGE ARRIVAL MINUTE INTERVALS

<u>Off-Peak Hour TIME OF DAY</u>	<u>EMPLOYEE LOT</u>	<u>GREEN LOT</u>	<u>ORANGE LOT</u>	<u>YELLOW LOT</u>
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<sup>4</sup> The Department does not include an off-peak time interval objective in its Work Management System objectives.

10:00 p.m. - 6:00 a.m.	2.92	4.51	3.89	4.97
8:00 a.m. - 5:00 p.m.	3.18	3.31	3.68	3.20

In addition, we observed that the average arrival time interval during peak hours and off-peak hours were 3.2 minutes and 3.7 minutes, respectively. This is a difference of only 16 percent whereas the Department's objectives indicate the difference should be 100 percent.

In our opinion, the above off-peak average shuttle bus time intervals further indicate a lack of adequate Department analysis and monitoring of shuttle bus schedules. With adequate shuttle bus monitoring, the Department would have known that the average off-peak shuttle bus arrival time interval was approximately one-half of the Department's objective. In addition, the Department would have known that average off-peak hour arrival time intervals were only slightly longer (30 seconds) than average peak-hour arrival time intervals. Further, the Department would have known that rider demand did not justify the level of service being provided. For example, we observed that no riders either boarded or deboarded approximately 60 percent of the shuttle buses from some of the lots during off-peak hours. In addition, we observed that the average number of riders per shuttle bus was less than one for the Yellow Lot from 10:00 p.m. to 8:00 a.m.

In our opinion, the results of our shuttle bus service observations evidence the need for the Department to:

- Analyze its shuttle bus service and rider demand;
- Establish a shuttle bus service level and schedule that is efficient and adequate;



- Establish, in writing, the number of contract personnel required to carry out its shuttle bus schedule; and
- Monitor AMPCO's performance and billings against the Department's established level of service.

It should be noted that the City Auditor's Office created a computerized database file for the 1,983 shuttle bus trips we observed on October 13, 1988, October 14, 1988, and March 3, 1989. In addition, the Office created a data base of over 1,700 vendor invoices for shuttle bus repairs and maintenance from July 1988 through January 1989. Further, the Office developed a computerized spreadsheet to facilitate calculating actual shuttle bus driver hours and comparing these hours to Department authorized shuttle bus driver hours. The City Auditor's office is willing to share this information with the Department and provide advice and assistance at the Department's request.

**SAN JOSE'S COST PER SHUTTLE  
PASSENGER IS TWO TO TWO AND  
ONE-HALF TIMES HIGHER THAN  
SAN FRANCISCO AND OAKLAND**

When compared to San Francisco and Oakland, San Jose's cost to operate its shuttle service in 1987-88 was two to two and one-half times higher. TABLE VIII compares San Jose's cost per shuttle passenger to San Francisco and Oakland in 1987-88.

TABLE VIII  
COMPARISON OF SAN JOSE'S COST PER SHUTTLE PASSENGER  
TO SAN FRANCISCO AND OAKLAND IN 1987-88

<u>Description</u>	<u>San Jose</u>	<u>San Francisco</u>	<u>Oakland</u>
Annual cost of shuttle	\$1,950,500	\$1,841,500	\$480,100
Number of passengers	1,515,000	2,804,000	978,000
Cost per passenger	\$1.29	\$0.66	\$0.49
Targeted minute interval between buses:			
Peak period	2.5-3.0	5.0-6.0	3.0-5.0
Off-peak period	5.0-6.0	20.00	10.00
Number of buses in use	14-15	12	6
Passenger capacity	17-31	32	9
Average number of passengers per round trip	2.7 <sup>5</sup>	n/a	4

As shown above, in 1987-88, San Jose operated its shuttle bus service program at a cost two to two and one-half times higher per passenger than Oakland and San Francisco. This difference will likely be even greater in 1988-89, given that San Jose's shuttle bus costs are estimated to be about 50 percent higher in 1988-89 than they were in 1987-88.

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<sup>5</sup> Based on observations on October 13, 1988, October 14, 1988, and March 3, 1989.

It should be noted that San Jose's, San Francisco's and Oakland's shuttle bus services are not exactly comparable. For example, San Francisco contracts out its entire shuttle bus service including buses, drivers and repairs and maintenance. Oakland, on the other hand, rents its shuttle vans and paid its drivers from \$5.36 - \$7.58 per hour. San Jose, conversely, spent \$1,131,020 to purchase its shuttle buses and paid its drivers from \$8.98-\$9.71 per hour. Even after allowing for these differences, in our opinion, a cost per passenger variance of two to two and one-half times seems excessive.

**THE COST TO REPAIR AND MAINTAIN  
THE AIRPORT'S SHUTTLE BUSES  
APPEARS TO BE EXCESSIVE**

Mobile Equipment Repair Service, Inc. (Mobile) has been maintaining and repairing the Airport's fleet of shuttle buses since 1982. The Department uses an Open Purchase Order to acquire Mobile's services. The City has never requested formal bids for the Department's shuttle bus repairs and maintenance. In addition, the City Council has never been appraised of the value of the Open Purchase Order with Mobile in spite of the fact that:

- The cost to repair and maintain shuttle buses has gone from \$289,463 in 1985-86 to an estimated \$1,057,700 in 1988-89.
- The estimated annual cost to repair and maintain the Airport's shuttle buses exceeds the vehicles' original purchase price in many cases.

- San Jose is estimated to spend four times as much per shuttle bus for repairs and maintenance as does San Francisco and seven times what the City of San Jose pays to repair and maintain its other passenger vehicles.
- 

In our opinion, the above situation requires the Department to reassess its options for repairing and maintaining its shuttle bus fleet.

**Shuttle Bus Repairs And Maintenance  
Are Estimated To Exceed  
\$1 Million Dollars In 1988-89**

Since 1985-86, the cost to repair and maintain the Department's shuttle buses has increased dramatically. The following summary shows that the percentage increase in shuttle bus repair and maintenance costs since 1985-86 has varied from 40.2 percent to 85.3 percent per year.

<u>Fiscal Year</u>	<u>Costs of Shuttle Bus Repairs and Maintenance</u>	<u>Percentage Increase</u>
1985-86	\$ 289,463	
1986-87	405,806	40.2
1987-88	570,950	40.7
1988-89	1,057,700 <sup>6</sup>	85.3

In only four years, shuttle bus repair and maintenance costs are estimated to triple to over \$1 million in 1988-89.

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<sup>6</sup> Estimated.

The Estimated Annual Cost To Repair And Maintain Some Shuttle Buses Exceeds Their Original Purchase Price

The Department acquired its fleet of 26 shuttle buses from 1981 to 1988. The total purchase price for these 26 shuttles was \$1,131,020. Shuttle bus purchase prices ranged from \$38,115 to \$53,550 and averaged \$43,500.

In 1988-89, we estimate that the Department will spend an average of \$40,683 per shuttle bus for repairs and maintenance. We further estimate that the cost per shuttle bus for repairs and maintenance in 1988-89, will vary from a low of \$19,033 to a high of \$79,923. TABLE IX summarizes, by shuttle bus, the bus number, model year, original purchase price, bus mileage, actual repair and maintenance costs from July 1988 through January 1989, and estimated 1988-89 repairs and maintenance costs.

TABLE IX

SUMMARY BY SHUTTLE BUS OF BUS NUMBERS, MODEL YEAR,  
PURCHASE PRICE, MILEAGE, ACTUAL REPAIRS AND  
MAINTENANCE COSTS FROM JULY 1988 THROUGH JANUARY 1989  
AND ESTIMATED 1988-89 REPAIRS AND MAINTENANCE

Bus Number*	Model Year*	Purchase Price	Bus Mileage*	7/88	Actual Repairs and Maintenance Costs					Estimated For 1988-89		
					8/88	9/88	10/88	11/88	12/88		1/89	Total
11	1987	\$45,863	30,752	\$802.89	\$1,429.47	\$1,247.45	\$1,318.23	\$1,281.11	\$2,464.37	\$25,59.26	\$11,102.78	\$19,033.34
25	1988	45,863	47,664	1,397.32	2,839.85	2,256.73	1,948.87	2,450.41	3,008.77	1,511.62	15,413.57	26,423.26
9	1987	45,863	42,221	2,158.11	1,404.95	1,373.68	2,819.43	1,499.08	3,026.23	3,506.48	15,787.96	27,065.07
23	1988	45,863	57,814	2,017.07	1,086.93	3,643.34	2,912.04	1,631.16	2,297.83	2,462.63	16,051.00	27,516.00
26	1988	45,863	28,113	1,789.35	1,314.22	2,093.35	2,318.50	2,157.55	4,177.56	2,204.31	16,054.84	27,522.58
21	1987	45,863	58,532	4,079.77	1,623.08	1,472.67	2,379.31	1,182.75	1,329.51	4,689.06	16,756.15	28,724.83
18	1987	45,863	61,531	2,452.87	2,746.73	1,709.90	2,594.79	2,973.96	3,710.97	923.62	17,112.84	29,336.30
10	1987	45,863	31,340	1,928.08	3,875.95	1,525.80	3,371.49	1,479.15	2,077.09	3,005.78	17,263.34	29,594.30
16	1985	53,550	63,358	885.97	5,224.26	2,851.01	2,881.07	3,797.96	1,693.66	793.00	18,126.93	31,074.74
17	1985	53,550	56,859	3,105.69	1,953.39	1,949.96	5,060.23	3,027.70	1,367.31	2,698.75	19,163.03	32,850.91
24	1988	45,863	55,146	2,721.56	1,464.03	3,120.15	1,611.34	3,983.41	1,762.67	4,857.78	19,520.94	33,464.47
1	1981	41,465	31,5417	1,098.27	2,380.92	2,992.07	2,659.50	5,534.05	3,691.81	2,150.77	20,507.39	35,155.53
7	1985	38,811	179,434	3,784.64	4,280.39	2,134.38	4,163.67	2,915.09	2,135.98	2,327.68	21,741.83	37,271.71
20	1987	45,863	45,299	546.55	0	12,165.48	3,391.70	2,641.01	2,219.25	795.53	21,759.52	37,302.03
19	1987	45,863	59,741	2,535.98	2,685.54	3,017.58	2,057.73	4,794.42	4,402.27	2,622.71	22,116.23	37,913.54
22	1988	45,863	54,777	2,131.38	1,833.45	2,645.27	3,377.88	1,503.56	5,686.08	5,258.30	22,435.92	38,461.58
15	1986	38,115	141,999	5,816.87	3,164.40	2,594.50	2,875.43	3,108.10	4,261.75	2,161.70	23,982.75	41,113.29
5	1985	38,811	172,215	6,000.58	3,844.91	1,501.43	2,524.23	7,064.90	2,442.88	2,528.55	25,907.48	44,412.82
4	1981	41,465	317,421	0	12,934.63	2,712.21	1,972.59	1,897.10	2,920.56	3,545.17	25,982.26	44,541.02
2	1981	41,465	322,158	2,196.33	2,353.89	6,469.48	4,707.96	7,150.46	1,502.03	3,636.13	28,016.28	48,027.91
14	1986	38,115	129,356	3,031.30	3,515.77	4,536.92	2,424.99	2,480.98	15,242.59	759.05	31,991.60	54,842.74
12	1986	38,115	121,205	2,151.42	3,307.24	6,174.31	5,166.59	3,042.30	12,254.57	1,785.12	33,881.55	58,082.66
13	1986	38,115	129,243	6,163.79	5,475.42	3,389.97	3,244.65	4,710.31	7,221.26	5,624.85	35,830.25	61,423.29
6	1985	38,811	158,391	3,960.33	6,037.96	3,009.13	3,854.20	13,248.66	4,679.87	1,603.14	36,393.29	62,388.50
3	1981	41,465	333,047	2,544.89	3,910.77	1,239.89	14,519.29	0	10,878.18	4,410.68	37,503.70	64,292.06
8	1985	38,811	165,633	7,795.72	7,525.40	6,090.20	3,809.76	14,045.07	726.94	6,628.95	46,622.04	79,923.50
Totals		\$1,131,020		\$73,096.73	\$88,213.55	\$83,916.86	\$89,965.47	\$99,600.25	\$107,181.99	\$75,050.62	\$617,025.47	\$1,057,757.95

\* - Per Airport Department 1988-90 Budget Submission

Our estimate of 1988-89 repairs and maintenance costs is based upon actual costs from July 1988, through January 1989. We determined these actual costs by accumulating, by shuttle bus, more than 1,700 invoices that Mobile billed to the Department for services rendered during that period.

As is shown in TABLE IX, estimated repairs and maintenance in 1988-89 exceeds the original purchase price for 10 of the Department's 26 shuttle buses (shuttle bus numbers 2, 3, 4, 5, 6, 8, 12, 13, 14, and 15).

It should be noted that we also did a detailed analysis of repairs and maintenance costs for August 1988. Our analysis is summarized in Appendices B, C, and D.

San Jose Is Estimated To  
Spend Four Times As Much  
Per Vehicle For Repairs And  
Maintenance As Does San Francisco

San Francisco International Airport contracts out its shuttle bus service. The contractor provides San Francisco International with the shuttle buses, the drivers, and all repairs and maintenance. The following comparison of repairs and maintenance costs for San Jose and San Francisco is based upon our review of San Francisco's shuttle bus contract and our analysis of San Jose's shuttle bus service.

TABLE X  
COMPARISON OF ESTIMATED SHUTTLE BUS REPAIRS AND  
MAINTENANCE COSTS FOR SAN JOSE AND  
SAN FRANCISCO DURING 1988-89

	<u>San Jose</u>	<u>San Francisco</u>
Number of Shuttle Buses	26	12
Passenger Capacity	17-31	32
Annual Shuttle Bus Hours	134,044	58,700
Annual Repairs and Maintenance	\$1,057,757	\$114,827
Hourly Repairs and Maintenance	\$7.89	\$1.95
Daily Hours Per Shuttle Bus	14.1	13.4
Annual Repairs and Maintenance per Shuttle Bus	\$40,683	\$9,569

As is shown above, San Jose's estimated cost per shuttle bus for repairs and maintenance is more than four times what San Francisco pays under the terms of their contract (\$40,683 vs. \$9,569). It should be noted that San Francisco runs its larger capacity shuttle buses about the same number of hours a day as San Jose (13.4 hours vs. 14.1 hours). Thus, it would seem that repairs and maintenance costs per shuttle would be more comparable given the similarity in usage.

Another indication that shuttle bus repairs and maintenance costs are excessive is the City of San Jose's costs for repairing and maintaining its other vehicles. Our discussions with City of San Jose budget personnel revealed that the City pays about \$6,000 per vehicle for repairs and maintenance. While shuttle buses and other City vehicles are not directly comparable, in our opinion, a cost disparity per vehicle for repairs and maintenance of nearly seven times is certainly indicative of a problem.



As was noted earlier, the Airport has used an Open Purchase Order with Mobile Equipment Repairs Service, Inc. for shuttle bus repairs and maintenance since 1982. Because the Airport uses an Open Purchase Order, these services have not been formally put out to competitive bid or specifically approved by the City Council. According to General Service Department officials, they do attempt to get quotes from different vendors on open purchase orders. However, in the case of the shuttle bus repair and maintenance Open Purchase Order, that has been difficult. According to General Services officials, the Airport has insisted that shuttle bus repairs be done on-site at the airport. Mobile is the only vendor that can provide on-site repairs. As a result, other vendors do not bid for the shuttle bus repairs and maintenance Open Purchase Order. According to a General Services official, other vendors are available to repair and maintain shuttle buses off-site from the airport.

#### REQUESTED SHUTTLE SERVICE INCREASES WERE NOT JUSTIFIED

In March 1986, the Deputy Director of Airport Finance/Property wrote a memorandum to the Deputy City Manager requesting a \$491,000 increase in the contractual parking management budget allocation for 1986-87. This represented a significant increase over the 1985-86 budget and the previously proposed 1986-87 budget as is shown below.

## CONTRACTUAL PARKING BUDGET

<u>1985/86</u>	Original 1986/87 <u>Request</u>	Revised 1986/87 <u>Request</u>
\$1,309,000	\$1,891,500	\$2,382,500

According to the memorandum,

*“...Current expenses reflect the shuttle service expansion...to meet service demands which have doubled over the previous year...”  
(emphasis added)*

Based upon the Department's perception of shuttle bus ridership by January 1986, the number of shuttle driver hours nearly doubled from a budgeted 745 hours per week to an actual 1,466 hours per week. However, our analysis revealed that rather than a doubling of shuttle bus ridership, a more modest increase of 37 percent had occurred. TABLE XI summarizes our analysis of shuttle ridership from 1983-84 through 1987-88.

TABLE XI

### SUMMARY OF SHUTTLE RIDERSHIP 1983-84 THROUGH 1987-88

<u>Fiscal</u> <u>Year</u>	<u>Shuttle</u> <u>Ridership</u>	<u>Percentage</u> <u>Increase</u>
1983-84	821,085	
1984-85	978,756	19%
1985-86	1,341,022	37%
1986-87	1,465,521	9%
1987-88	1,514,974	3%

It should be noted that in addition to the increase in driver hours noted above, several other increases have occurred. These other increases are shown below.

<u>Fiscal</u> <u>Year</u>	Increase in Shuttle Bus Driver Hours Over	Percentage Increase In Shuttle Driver
------------------------------	--	--

	the Previous <u>Year</u>	Hours over the <u>Previous Year</u>
1984-85	9,524	42%
1985-86	39,832	124%
1986-87	10,542	15%
1987-88	7,051	9%
1988-89	42,181	47%

Based upon our analysis of shuttle ridership, the above increases in shuttle driver hours were not justified, given the level of demand that ridership demonstrated.

#### **THE DEPARTMENT CAN SAVE MORE THAN \$1 MILLION ANNUALLY**

Opportunities exist for the Department to improve the economy and efficiency of its shuttle bus service. We estimate that the Department could save more than \$1 million annually if it considered service level alternatives. These alternatives include:

- Combining existing shuttle bus routes
- Adjusting shuttle bus schedules to coincide with ridership demand and other levels of service indices.

#### **Combining Existing Routes**

There are four shuttle bus routes at the Airport - Employee, Green, Orange, and Yellow (see Appendix A). The Orange and Green Lots are approximately equidistant from the terminal. The Yellow and Employee Lots are about three-tenths of a mile farther from the terminal than the Orange and Green Lots. The Department could modify its shuttle bus schedule to combine the Orange and Green Lots into one route and the Yellow and Employee Lots into a second route. We estimate that these

combined shuttle bus routes would save the Department approximately \$1,300,000 per year as is shown in TABLE XII.

TABLE XII  
CALCULATED ANNUAL SAVINGS RESULTING  
FROM COMBINING THE ROUTES FOR THE  
ORANGE AND GREEN LOTS AND THE  
YELLOW AND EMPLOYEE LOTS

	Alternative Routes	Estimated Minutes Per Shuttle Bus Round Trip <sup>7</sup>	Arrival Time Minute Intervals <sup>8</sup>	Number of Bus Required	Estimated Annual Costs and Savings
<u>Off-Peak Hours</u>					
	Yellow/Employee	22	6	4	
	Orange/Green	21	6	4	
Total Buses Required				8	
Off-Peak Hours Per Day				<u>x15</u>	
Required Off-Peak Bus Hours Per Day				<u>120</u>	
<u>Peak-Hours</u>					
	Yellow/Employee	22	3	7	
	Orange/Green	21	3	<u>7</u>	
Total Buses Required				<u>14</u>	
Peak-Hours Per Day				<u>x7</u>	
Required Peak Bus Hours Per Day				<u>98</u>	
Total Daily Bus Hours Required (120 + 98=218)				<u>218</u>	
Current Daily Bus Hours (Estimated)				<u>367</u>	
<u>Annual Savings</u>					
Daily Bus Hours Saved (367-218=149)					149
Percent of Bus Hours Saved (149/367=41%)					41%
Estimated Annual cost of Shuttle Bus Service					\$3,084,000
ESTIMATED ANNUAL SAVINGS (\$3,084,000 x 41%)					\$1,264,440

<sup>7</sup> Estimated by adding 7 minutes to observed shuttle bus round trip times on October 13, 1988, October 14, 1988, and March 3, 1989.

<sup>8</sup> Per Department's objectives of 2.5-3 minute intervals for Peak-Hours and 5-6 minute intervals for Off-Peak Hours.

Another, less severe, route modification would be for the Airport to only combine shuttle bus routes for the Yellow and Employee Lots. We estimate that combining the routes for the Yellow and Employee Lots would save the Department approximately \$1,100,000 per year as is shown in TABLE XIII.

TABLE XIII

CALCULATED ANNUAL SAVINGS RESULTING  
FROM COMBINING THE ROUTES FOR THE  
YELLOW AND EMPLOYEE LOTS

Alternative Routes*	Estimated Minutes Per Shuttle Bus Round Trip	Arrival Time Minute Intervals**	Number of Bus Required	Estimated Annual Costs and Savings
Off-Peak Hours				
Yellow/Employee	22*	6	4	
Orange	13***	6	2	
Green	14***	6	2	
Total Buses Required			8	
Off-Peak Hours Per Day			x15	
Required Off-Peak Bus Hours Per Day				120
Peak-Hours				
Yellow/Employee	22*	3	7	
Orange	13***	3	4	
Green	14***	3	5	
Total Buses Required			16	
Peak-Hours Per Day			x7	
Required Peak Bus Hours Per Day				112
Total Daily Bus Hours Required (120 + 112=132)				232
Current Daily Bus Hours (Estimated)				367
Annual Savings				
Daily Bus Hours Saved (367-232=135)				135
Percent of Bus Hours Saved (135/367=37%)				37%
Estimated Annual cost of Shuttle Bus Service				\$3,084,000
ESTIMATED ANNUAL SAVINGS (\$3,084,000 x 37%)				\$1,141,080

In our opinion combining the routes for the Yellow and Employee Lots is a practical concept given that:

- We observed that ridership for the Yellow Lot is 43 percent less than the Green and Orange Lots.

- The Yellow and Employee Lots are contiguous to one another.

Adjusting Shuttle Bus Schedules To  
Coincide With Ridership Demand And  
Other Levels Of Service Indices

Another shuttle bus efficiency alternative is for the Airport to adjust its shuttle bus schedules to reflect passenger demands. For example, we estimate that the Airport could save approximately \$900,000 in shuttle bus costs by adjusting its arrival time intervals to four minutes during peak hours and five minutes during off-peak hours. TABLE XIV summarizes our calculations of annual cost savings that would result from adjusting shuttle bus arrival time intervals.

TABLE XIV

**CALCULATED ANNUAL SAVINGS RESULTING FROM  
ADJUSTING SHUTTLE BUS ARRIVAL TIME INTERVALS**

	Adjusted			Number	Estimated
Color Shuttle Bus Routes	Minutes Per Shuttle Round Trip	Arrival Minute	Time of Bus Intervals	Annual Required	Costs and Savings
Off-Peak Hours					
Yellow	15	5	3		
Orange	13	5	3		
Green 14	5	3			
Employee	11	5	2		
Total Buses Required				11	
Off-Peak Hours Per Day of Operation					x15
Required Off-Peak Bus Hours Per Day					165
Peak Hours					
Yellow	15	4	4		
Orange	13	4	3		
Green 14	4	4			
Employee	11	4	3		
Total Buses Required				14	
Peak Hours Per Day				x7	
Required Peaked Bus Hours Per Day					98
Total Daily Bus Hours Required (165+98=263)					263
Current Daily Bus Hours (Estimated)					367
Annual Savings					
Daily Bus Hours Saved (367-263=104)					104
Percent of Bus Hours Saved (104/367=28%)					
28%					
Estimated Annual Cost of Shuttle Bus Service					
\$3,084,000					
ESTIMATED ANNUAL SAVINGS (\$3,084,000 x 28%)					
\$863,520					

In our opinion, modifying arrival time intervals to four and five minutes for peak and off-peak hours respectively, would not adversely affect the Airport's shuttle bus service for the following reason:

- We observed that average peak hour arrival time intervals are about 3.2 minutes. Thus, a four minute interval would add less than a minute to average peak hour arrival time intervals.
- We observed that 30 percent of shuttle buses are arriving and leaving the terminal empty.
- We observed that the average shuttle bus ridership is only 2.68 persons.

Based upon our observations of shuttle bus operations, better Department shuttle bus coordination and monitoring could result in some of the savings shown above without adversely impacting shuttle bus levels of service.

It should be noted that under the contract with the parking operator, the Department may prescribe the level of service for the shuttle bus service. Also, the Department may review and approve the bus schedule and routes AMPCO prepares. Accordingly, the Department can change or modify the number of shuttles, drivers, hours, or bus routes to realize any of the savings shown in TABLES XII, XIII or XIV.

#### Additional Parking Operations Staff

Airport parking generates \$12,000,000 a year and is the Airport Department's largest source of revenue. In addition, the shuttle bus program has grown to become a \$3,000,000 a year program. The Airport Department has only two staff positions to administer both the parking lot and shuttle



bus programs. These positions are one Parking Coordinator and one Account Clerk. The size, importance, and complexities of the Parking Program justify additional staff resources. Further, our observed lack of shuttle bus schedule analysis, monitoring and coordination appears to be a direct result of limited staff resources. This situation will only worsen when Terminal A opens in November 1989. Finally, our observations in FINDING II also evidence the need for additional Parking Operations staff. In our opinion, the Airport Department should consider adding staff to Airport Parking Operations. Such additional staff will prove to be cost effective to the extent their efforts result in improved shuttle bus economies and efficiencies.

## CONCLUSION

By improving the efficiency of its shuttle bus program, the Airport Department could save more than \$1 million per year. In order to effect such savings, the Department should:

- Analyze its shuttle bus service and rider demand;
- Establish a shuttle bus service level and schedule that is efficient and adequate;
- Establish in writing, the number of contract personnel required to carry out its shuttle bus schedule;
- Monitor AMPCO's performance and billings against established levels of service and authorized personnel levels;
- Consider alternative means to secure shuttle bus repairs and maintenance; and
- Consider adding staff to Airport Parking Operations.

## RECOMMENDATIONS

We recommend that the Airport Department:

### Recommendation #1:

Improve the number and visibility of shuttle bus signs in front of the main terminal. (Priority 3)

### Recommendation #2:

Revise its policy of requiring that shuttle bus repairs and maintenance be performed on-site. (Priority 1)

### Recommendation #3:

Request that the General Service Department competitively bid the shuttle bus repairs and maintenance contract and that the City Council approve the contract. (Priority 1)

### Recommendation #4:

Conduct an in-depth analysis of shuttle bus schedules and passenger demand and modify its service level objectives and shuttle bus routes and schedules accordingly. (Priority 1)

Recommendation #5:

Formally establish and approve contractor provided shuttle bus driver hours and monitor contractor billings for compliance. (Priority 1)

Recommendation #6:

Consider adding staff to Airport Parking Operations. (Priority 1)

## FINDING II

### THE AIRPORT DEPARTMENT NEEDS TO IMPROVE CONTROLS OVER ITS \$12 MILLION A YEAR PARKING OPERATION

The Airport Department projects that in 1988-89, parking operations will produce about \$12 million in revenue. This is the Department's primary revenue source. The Department should have a stringent system of controls over parking revenue. However, our review revealed that critical parking operation revenue controls do not always function properly. Specifically, the automatic parking equipment and computerized revenue control system are obsolete and individual components constantly break down. System software documentation is lacking as are formal back-up procedures. In addition, in our sample of three consecutive days, we noted 1,656 errors on vehicle inventory lists. Further, the vehicle inventory process does not have adequate segregation of duties, inventory instructions are not followed, and inventory deletions are not controlled. Finally, daily parking operations reports are inaccurate. As a result, these conditions expose the Department to significant revenue losses. The Department is implementing a new revenue control system. However, our recommended control improvements are still applicable to the new system.

#### Computerized Revenue Control System

The Department's computerized revenue control system is the parking operation's central nervous system. The system consists of the following components: Digital Equipment PDP 11/23 computer and software,

automatic ticket dispensers (ATDs), cashier activated terminals (CATs), automatic gate arms, and loop detectors.

- The computer is the core of the entire system. It constantly communicates with the other system components, summarizes transactions, and prints reports;
- The ATDs dispense tickets to each entering vehicle. The ATD's magnetically encode each ticket with the date, time, lane number and a serial number;
- Cashiers at each exit operate the CATs. The cashier enters the license plate number and inserts the customer's ticket into the CAT. The CAT communicates with the host computer to verify the status of the vehicle exiting, then calculates the parking fee;
- The automatic gate arms operate at each entrance and exit lane; and
- The loop detectors work directly with the ATDs and CATs. They sense when a vehicle has passed through an entrance or exit gate or backed-out.

To effectively control parking revenue, all system components must function properly at all times. In addition, all control policies must be judiciously followed. Some of the vital elements of this system are:

- The reliability of the host computer and the rest of the parking equipment, and the integrity of the computer files and software;
- The vehicle inventory process. AMPCO inventories all vehicles in the parking lots after midnight and enters the data into the computer. This process is used primarily to deter customers from claiming they lost their tickets and parked for a shorter time than they actually did. This process also provides a basis for reconciling the number of vehicles recorded as entering and exiting the parking lot each day;

- Department policy on lost tickets. Patrons claiming a lost parking ticket are to be charged a minimum of a 24-hour fee or a fee computed using the vehicle inventory as basis of the length of stay, whichever is more;
- The accuracy of the contractor's daily reporting of operating results and other statistics. These reports allow the Department to check for revenue shortages and analyze trends.

The computerized revenue control system uses a computer program specifically modified for the San Jose International Airport. This software controls the entire parking revenue system. This software is used to detect the following:

- Length of time a vehicle has been in the parking lot. This protects against customers claiming they lost their ticket and parked only for a short time;
- Identifies "backout" tickets. This is when a vehicle at the entrance gate gets a ticket and backs away instead of entering the parking lot. This protects against someone substituting a back-out ticket for a ticket with a higher parking fee;
- An exit gate is left open for an unusual length of time. This protects against unauthorized free exits;
- A CAT not responding or turned off. This protects against cashier impropriety;
- Shut-off of the central computer itself. This too protects against cashier improprieties;
- Submission of previously used ticket. This protects against ticket substitutions;

- A license plate number which should have been in the overnight vehicle inventory computer file but is not. This protects against inventory taker improprieties;
- An ATD at the entrance gate running low on tickets. This alerts AMPCO to refill the ATD to prevent delays to customers entering the lot; and
- An ATD not responding or jammed. This protects against customer delays.

### Deficiencies In Critical Control Systems

The Department relies on its revenue control systems to protect its primary revenue source -- airport parking fees. Accordingly, to the extent these systems do not function properly, the Department is exposed to revenue losses from errors, irregularities and embezzlements.

Recent instances of airport parking embezzlements illustrate the need for stringent and effective controls over parking revenue. Specifically, Los Angeles and Orlando International Airports have incurred losses. Los Angeles International Airport estimates losing at least \$6 million to parking embezzlement during 1986.

It should be noted that we did not identify specific instances of embezzlement at the San Jose Airport. However, it should also be noted that the purpose of our audit was not to identify specific instances of embezzlement. Instead, the purpose of our audit was to assess the Department's degree of susceptibility to errors, irregularities and embezzlements. To that end, our review revealed the following three critical

controls over parking revenue that should be improved in order to reduce the Department's exposure to significant revenue losses:

- Automatic parking equipment and computerized revenue control system components,
- Vehicle inventory, and
- Daily parking reports.

#### **THE AUTOMATIC PARKING EQUIPMENT AND COMPUTERIZED REVENUE CONTROL SYSTEM COMPONENTS BREAK DOWN OFTEN**

Although we did not find an instance where the Department's computerized parking revenue control system broke down entirely, we did note numerous instances of individual components breaking down. Such individual component breakdowns are significant in that they jeopardize the integrity of the entire revenue control system. In addition, we noted that the system's specially designed computer software lacks source code documentation (a listing of the program instructions) and proper backup to protect against the accidental loss of valuable parking information.

#### **System Component Breakdowns**

Interviews with AMPCO staff indicated that the Cashier Activated Terminals (CATs) frequently break down. We subsequently verified this information by reviewing weekly maintenance reports from July 13, 1988, to September 3, 1988. Our review revealed that a contracted technician repaired the CATs every day he worked during this period. There are seven hourly and five daily parking lanes. We found that over this 52-day period,



automated parking equipment on one to seven lanes were broken down 175 times. This is an average of almost 24 times per week. Since the CATs are an integral component of the Airport's revenue control system, 24 breakdowns per week constitutes a serious breach of the Department's internal controls. The primary reason for these CAT breakdowns is that the equipment is old and obsolete. APPENDIX E shows excerpts from the technician's Weekly Activity Report. These excerpts show the malfunctions and the maintenance performed on the parking equipment.

To get an indication of the financial impact of equipment malfunctions, we compared the daily parking lot revenues collected on days when malfunctions occurred to days when no malfunctions occurred. Unfortunately, our test was limited by the fact that there were only four days of the 52 days we reviewed when no malfunctions occurred. Nevertheless, our test results were revealing. Our test showed that parking revenues averaged higher on malfunction-free days. Specifically, we found that revenues averaged \$183 a day to \$1,202 per day higher on malfunction-free days.

During our review, one of our auditors had a first-hand experience with a revenue control system malfunction. The auditor was at the Airport to observe shuttle bus operations (FINDING I). He parked his car in the hourly parking lot on October 14, 1988 midnight to 2:00 A.M. As he exited, he paid the correct fee of \$2.50. As part of his assignment, the auditor returned to the hourly parking lot 14 hours later at 4:00 P.M. Upon attempting to exit at 6:05 P.M., the computer incorrectly showed that the auditor's vehicle had been parked for more than 12 hours and that he owed \$24.00. The cashier and AMPCO Supervisor tried to locate the Department

Parking Coordinator for direction. After an extended wait for an answer, the auditor paid the \$2.50 he owed and signed an IOU for the difference.

Incidentally, the AMPCO supervisor would not give the auditor a copy of the IOU. The supervisor advised the auditor to contact the Department Parking Coordinator in order to clear the IOU. The auditor finally exited the parking lot after a 45 minute delay.

According to the AMPCO supervisor, this is a common and embarrassing problem. An AMPCO cashier said, “It will be a miracle if the system doesn’t malfunction in two consecutive days.” As a result of the system malfunctions, customers become enraged when they are overcharged. Since AMPCO employees lack the authority to take the appropriate action in these situations, they have to track down Department management to resolve these issues. This can be a very time consuming and frustrating experience for customers.

## System Documentation And Written Backup Procedures Lacking

Our review revealed that the Department lacks source code documentation for its crucial system software. Further, Electron, Inc., the company that designed and sold the system to the Department, is out of business. Fortunately, the Department has contracted with the computer programmer that used to work for Electron, Inc. However, in the programmer's absence, without system documentation, the Department cannot correct or modify the software to fix problems, produce new or better reports, nor add or improve controls.

We also noted that the Department has only one back-up copy of the revenue control system software and its other computer files. Backing-up software is important because employees can inadvertently change, delete or lose files. Also, data storage media can deteriorate with use or age. Therefore, it is a common practice to have more than one back-up copy of important computer files. This also protects against disasters such as fires or earthquakes destroying computer programs and files.

The computer files are stored in a room adjacent to the computer room. Earlier in our audit we noted that the files were stored in the same room as the computer. This is not an acceptable practice because any threat to the computer could also jeopardize data stored in the same area. The Department moved the files after we discussed the situation with them.

Our audit also revealed that the Department lacks formal written procedures for backing-up its computer system. As a result, the computer

operator lacks instructions or guidelines for correcting errors or handling malfunctions. Furthermore, the operator is an AMPCO employee and has no formal training on computers or related equipment. In our opinion, this increases the need for written procedures.

The following example illustrates the importance of system documentation and written procedures. On August 24, 1988, the computer operator was trying to back-up the revenue control system computer files, when one of the computer's disk packs malfunctioned. Consequently, the computer operator was unable to properly back-up the revenue control system. The system began to show the error message "FILE ERROR ADDR: 017114 DATA: 177726." The error message continued for at least 15 days before the contract computer programmer could terminate the message. However, without the system documentation or the programmer, the Department was unable to correct the situation. The consequences of this error remain unknown.

#### **VEHICLE INVENTORY PROCEDURES NEED TO BE IMPROVED**

The computerized vehicle inventory process is a very important part of the Department's revenue control system. The Department uses vehicle inventory information to deter customers from claiming they lost their tickets and/or parked for fewer hours than they actually did. On one of our sample days, 26 customers claimed they lost tickets. Without an effective inventory process, lost ticket claims would go unchallenged because there is no way to verify how long the vehicle has been in the lot.

Another important function of the vehicle inventory process is to protect against cashier embezzlements. Although we did not detect any embezzlements, our observations of the vehicle inventory process raised questions about the accuracy of the vehicle inventory, the integrity of the process, and the Department's exposure to embezzlement.

### The Vehicle Inventory Process

Generally, Parking Operations conducts the vehicle inventory daily on all the lots from midnight to 5 A.M. This is when very few customers exit the parking lots. However, the process frequently extends past 6 A.M. This is about the time the parking lots get busy again.

Cashiers and shuttle bus drivers are assigned specific parking lot sections for vehicle inventory taking purposes. They record on inventory forms the license plate numbers and the location of all the vehicles in the parking lots.

The AMPCO supervisor collects the completed inventory forms and prepares an Inventory Control Log. The AMPCO data entry clerk keys the data into the computer system.

## The System Switched Off-line Exposes The Department To Revenue Losses

During data entry, the computer is switched to an off-line mode. This means that if a customer exits when the computer is off-line, the CAT cannot access the computer to determine the vehicle's status or to compute the proper parking fee for lost tickets. In addition, when off-line, the system does not automatically delete the license plate numbers of exiting vehicles from the vehicle inventory. Instead, AMPCO staff delete these license plate numbers manually from the computer inventory.

During our observation of the inventory process and the backing-up of the computer files, the computer system did not function properly. After all the inventory data was entered and sorted, and the computer files were backed up, the operator could not return the system to an on-line mode. It took one hour and 15 minutes to go back on-line at about 8:00 A.M. This is after AMPCO got permission from the Department Parking Coordinator to call the technician for instructions. The period from 6:00 to 8:00 A.M. is a busy time for the Airport. Therefore, a delay in putting the computer on-line exposes the Department to revenue losses for those vehicles existing when the system is off-line.

When a vehicle exits the parking lot, the cashier enters the license plate number into the CAT. The CAT checks the computer's vehicle inventory and compares that information with the ticket's magnetic data. The CAT computes the parking fee based on the inventory information or the ticket information, whichever is greater. The inventory information also is used if customers claim to have lost their ticket. If the computer can not

find the license plate number in its inventory, then the customer's parking fee is based on a minimum of 24 hours.

It is an absolute necessity for the vehicle inventory file to be accurate. Otherwise, the Department's parking revenue will be inadequately protected against dishonest customers or cashiers. However, our review revealed numerous vehicle inventory inaccuracies.

### 1,656 Vehicle Inventory Errors In Just 3 Days

Our observation of the vehicle inventory process revealed numerous errors which raise questions about the accuracy of the vehicle inventory. For example, we noted a significant number of errors in the vehicle inventory list for three consecutive days in June 1988, selected at random. The Exceptions Report showed a total of 1,656 errors or 18.44% of the 8,981 vehicles counted. Of these 1,656 errors, 777 were "evaporation" exceptions. This means that these vehicles were in the previous day's inventory, but there was no record of these vehicles either in the current day's vehicle inventory or as having exited the lot. In other words, these vehicles simply "evaporated." An additional 560 errors were "purged" exceptions. These exceptions include vehicles on the previous day's "evaporation" list that were automatically deleted from the current day's report. In other words, the system automatically deletes vehicles that were on the previous day's evaporation list. In our opinion, the number of uncontrolled automatic system deletions is so large, it raises serious questions about the reliability of the entire computer inventory file. Without a reliable inventory file, the Airport is exposed to customers claiming they lost their ticket to escape paying a large parking fee and cashier embezzlements.

### Inadequate Separation Of Duties

We also observed that cashiers and shuttle bus drivers take the vehicle inventory. This situation violates the internal control principle of separation of duties for the cashiers. Specifically, cashiers are identifying vehicles left overnight and subsequently collecting money for those vehicles when they exit. This exposes the Department to the risk that a cashier could intentionally exclude vehicles from the overnight inventory. This would allow the cashier to keep the exiting customer's payment. Further, while using shuttle bus drivers as inventory takers does not violate the principle of separation of duties, it does represent an expensive inventory taking alternative. Given that shuttle bus drivers earn about \$10.00 per hour, the Department may be able to use less expensive staff for this process.

In addition, inventory takers are frequently assigned to the same parking lot sections. This practice exposes the Department to the risk that an inventory taker could conspire with a customer to park in an assigned section and intentionally omit the vehicle from the overnight inventory. The customer could then claim to have lost his or her ticket and pay at most, a full day's parking fee. This practice also makes it easier for inventory takers to collude to defraud the Department.



### Inventory Instructions Not Followed

Inventory takers are also not following instructions. AMPCO released informal instructions on how to write frequently misinterpreted letters and numbers. However, not all inventory takers are following these instructions. This increases the likelihood that erroneous data will be entered into the computer. Further, it is not possible to verify the accuracy of the license plates entered into the system during a specific day. This is because the computer system has not been programmed to print an exclusive list of license plate numbers entered each day. Since these entries cannot be verified, the Department is exposed to the risk of having erroneous vehicle inventory lists and resultant weaker internal controls.

### Unauthorized Vehicle Inventory Deletions Expose The Department To AMPCO Employee Fraud

We also found that inventory deletions are not properly reviewed and authorized. AMPCO employees delete license plate numbers in the computer inventory file which they think are erroneously entered. For example, if two license plate numbers are identical except for one number or letter, one license plate number may be arbitrarily deleted. The same may be true for license plate letters or numbers that appear to be transposed. Department personnel do not review or approve these deletions. As noted earlier, the system automatically deletes vehicle license plate numbers from the computer inventory files if they appear as “evaporation” exceptions for two consecutive days. Department personnel do not review or approve these deletions either. This lack of review and authorization exposes the Department to AMPCO employees defrauding the system.

In our opinion, the Department needs to improve its vehicle inventory procedures. Enhancements to the current procedures include:

1) using personnel other than cashiers and drivers to take the inventory, 2) periodically rotating inventory takers to different lots, 3) formalizing and standardizing inventory-taking procedures, and 4) requiring Department management approval of manual and system deletions of vehicle license plate numbers from the inventory.

### DAILY REPORTS ARE INACCURATE

The Department's third essential revenue control is AMPCO's daily reporting of operating results and other statistics. These reports monitor the daily parking revenue as well as the vehicle activity in the parking lot. Effective reporting should allow Department management to check for revenue shortages or overages and analyze trends. However, our review revealed that:

- The accounting for the vehicle inventory is inaccurate,
- Tickets are not properly accounted for, and
- Report preparers and reviewers are not identified.

As a result, AMPCO's daily reports do not function as an effective revenue control.

### Types Of Reports

Everyday, AMPCO prints a computerized Event Log, including vehicle inventory reports. The Event Log summarizes transactions for each

cashier for all shifts and highlights the following situations in the parking lots:

- An ATD low on tickets;
- Vehicle back-outs, and computer retention of the serial number of the back-out ticket;
- A gate arm at an exit lane being raised for more than two minutes;
- The computer being shut down;
- A non-responsive CAT;
- Stolen tickets; and
- Exiting vehicles missing from the vehicle inventory.

Appendix F shows samples of Event Log entries.

The vehicle inventory reports list license plate exceptions and license plate inventory entries for vehicles parked more than zero, 30, 60, and 90 days.

The Parking Lot Master Recap is a major report that AMPCO prepares manually and submits to the Department daily. This report summarizes daily revenue transactions, including cash and credit card collections, and revenue adjustments. The Recap is used to calculate the number of vehicles that should be in the overnight vehicle inventory. This calculated inventory should reconcile to the physical vehicle count.

The Department relies on these reports for computing the daily revenue that AMPCO must remit. These reports also provide oversight for the Department.

### Report Deficiencies

Our review revealed that the accounting for the vehicle inventory is inaccurate. For example, the vehicle inventory reconciliation report for June 24, 1988, showed that the physical vehicle count exceeded the computed count by 36 vehicles. This means that there were 36 more vehicles in the parking lot than were accounted for by the entry and exit counts for the day. This would be physically impossible if the entry and exit counts were accurate.

AMPCO is contractually obligated to pay the Department for unaccounted tickets. However, this cannot be enforced effectively because the vehicle inventory reconciliation report does not account properly for the total tickets issued during the day.

Furthermore, the Parking Lot Master Recap does not identify the preparer, reviewer, or supervisor who is responsible for the completeness and accuracy of the report. The report would be more reliable if it was signed by the preparer and the employee who reviewed it. This evidences supervisory review and accountability.

### New Revenue Control System

Currently, the Department is installing a new revenue control system called Parking Administration and Revenue Control System (PARCS). The

Department projects that it will be fully operational by June 1989. It will replace most of the existing equipment, including the computer. According to the contract specifications, PARCS will be more flexible than the current system but the basic controls and procedures will be the same. The purchase price for this new system is \$2,369,000. APPENDIX G compares the new PARCS to the current revenue control system.

We have identified additional controls or enhancements to existing controls. In our opinion, these additional controls or enhancements will reduce the Department's exposure to revenue losses. Based on our limited assessment of PARCS, we believe these recommended controls will also be applicable to the new system.

## CONCLUSION

The Department's primary revenue source is parking operations. Since cash or checks comprise 80 percent of parking revenue, it is essential that the Department employ a stringent system of revenue controls. The need for these controls is exacerbated because a contractor operates the parking lot for the Department and the Department has limited resources to oversee the contractor. We found that three of the Department's most critical parking operations controls do not always function properly. We have identified additional controls or enhancements to existing controls to reduce the Department's exposure to revenue losses. In our opinion, the recommendations apply to both the Department's existing and new revenue control systems.

## RECOMMENDATIONS:

We recommend that the Airport Department:

### Recommendation #7:

Ensure that PARCS source code documentation is available.  
(Priority 2)

### Recommendation #8:

Formalize written procedures for preparing computer file back-ups and prepare guidelines in case errors are made during the back-up process.  
(Priority 2)

### Recommendation #9:

Maintain at least two sets of computer file back-ups, including a set located off-site. (Priority 2)

### Recommendation #10:

Maintain a sufficient number of blank disk packs in case of disk pack failure. (Priority 2)

### Recommendation #11:

Require the parking contractor to comply with the contractual requirement to properly account for and reimburse the City for the value of unaccounted tickets. (Priority 2)

Recommendation #12:

Stop using cashiers as vehicle inventory takers and consider alternatives that are less costly than using shuttle bus drivers in the inventory process. (Priority 1)

Recommendation #13:

Periodically and randomly rotate the assignments of the vehicle inventory takers. (Priority 1)

Recommendation #14:

Formalize the inventory taking procedures to include standardizing the writing of frequently misinterpreted letters and numbers, accurate counting of vehicles, and reconciling total vehicles with the detailed exception reports. (Priority 2)

Recommendation #15:

Require that inventory errors remain in the error listings until properly investigated and approved for deletion by Department management. (Priority 1)

Recommendation #16:

Require Department management approval of Deactivation Logs of license plate numbers proposed for deletion from the vehicle inventory. (Priority 1)

Recommendation #17:

Produce a listing of the license plates keyed-in during the day to serve as a data entry verification control. (Priority 1)

Recommendation #18:

Revise the Parking Lot Master Recap to include the following:

- a. A reconciliation of tickets to inventory license plate entries;
  - b. Signature of the report preparer, reviewer and/or supervisor certifying the completeness and accuracy of the report;
  - c. Tabulation of free exits by:
    - Lane Number
    - Cashier Number and Name
    - Authorized by
    - Time started
    - Time ended
    - Number of tickets
    - Dollar value
  - d. Tabulation of chute exits by:
    - Cashier Number and Name
    - Supervised by
    - Authorized by
    - Time started
    - Time ended
    - Number of tickets
    - Dollar value
  - e. Explanations for chute exits and/or handwritten tickets.
- (Priority 1)